

## **Development of the ISS EMU SPEEDR**

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### **Abstract**

The Self Powered EVA EMU Data Recorder (SPEEDR) is an FPGA (Field-programmable gate array) based device designed to collect high-rate EMU (Extravehicular Mobility Unit) PLSS (Primary Life Support Subsystem) data for download at a later time. The existing EMU PLSS data down-link capability during EVA is one data packet every 2 minutes and is subject to bad packets or loss of signal. High-rate PLSS data is generated by the ECWS (Enhanced Caution and Warning System) but is not normally captured or distributed. Access to high-rate data will increase the capability of EMU anomaly resolution team to pinpoint issues remotely, saving crew time by reducing required call-down Q&A and on-orbit diagnostic activities. With no Shuttle flights post FY11, and potentially limited down-mass capability, the ISS crew and ground support personnel will have to be capable of on-orbit operations to maintain, diagnose, repair, and return to service EMU hardware, possibly through 2028. Collecting high-rate EMU PLSS data during both IVA (Intravehicular Activity) and EVA (Extravehicular Activity) operations will provide trending analysis for life extension and/or predictive performance. The SPEEDR concept has generated interest as a tool/technology that could be used for other ISS subsystems or future exploration-class space suits where hardware reliability/availability is critical and low/variable bandwidth may require "store then forward" methodology. Preliminary work in FY11 produced a functional prototype consisting of an FPGA evaluation board, custom memory/interface circuit board, and custom software. The SPEEDR concept includes a stand-alone battery that is recharged by a computer USB (Universal Serial Bus) port while data is being downloaded.